THE department of geology of Northwestern University will conduct a geological field course in the Lake Superior Region during August. It will be devoted largely to a study of the Pre-Cambrian rocks with some attention to the Pleistocene history. It is expected that a day or two will be spent at the head of Lake Superior where both the intrusive and the extrusive phases of the Keweenawan may be seen, as well as ancient lake beaches, great ore docks, etc.; one day on the Mesabi iron range; and one day on the productive portion of the Vermilion iron range. After this the class will live in camp and will travel by canoe through some of the lakes near the Minnesota-Ontario boundary where there are extensive exposures of various types of metamorphic and igneous rocks. These rocks will be studied and small areas will be mapped in detail.

UNIVERSITY AND EDUCATIONAL NEWS

AT the annual spring meeting of the General Education Board $789,980 was appropriated for institutions and projects to which the organization contributes. The largest appropriation was for the medical department of Washington University at St. Louis, which received $250,000. This makes $1,000,000 given by the board to this institution toward a total of $1,500,000 for the purpose of placing the teaching of medicine, surgery and pediatrics on a full-time basis. Other appropriations were: Coker College, Hartsville, S. C., $50,000; Colby College, Waterville, Me., $125,000; Rockford College, Rockford, Ill., $75,000; further prosecution of educational researches, $50,000; Spellman Seminary, Atlanta, Ga., $20,000; Hampton Institute, $25,000; Tuskegee Institute, $25,000; Morehouse College, Atlanta, $5,000; Fisk University, Nashville, $5,000; Mayesville Industrial School, Mayesville, S. C., $1,000; equipment of normal schools for negroes in North Carolina, $4,050; equipment of county training schools for negroes, $10,000; support of professors of secondary education, $34,130; state agents for white rural schools, $40,800; state agents for negro schools, $34,500; educational research in New Hampshire, $5,500; farm demonstration work in Maine and New Hampshire, $8,500.

PLANS for the union of the Jefferson Medical College with the University of Pennsylvania and the Medico-Chirurgical College and hospital have been completed. The Medico-Chirurgical College is to become a post-graduate school, to be known as the Medico-Chirurgical College and Hospital-Graduate School in Medicine of the University of Pennsylvania. The Jefferson Medical College will be connected with the university, but will maintain its identity.

THE University of Sheffield has received $160,000 by the will of Sir Edgar Allen, $25,000 for the applied science department, and the balance to be devoted to providing scholarships, half of them to be reserved for the sons of working men.

FRANK ADAMS has been appointed professor of irrigation investigations in the University of California. He will continue also his work in the irrigation and drainage investigations of the United States Department of Agriculture.

DR. ARTHUR HARMOUNT GRAVES, formerly assistant professor of botany in the Sheffield Scientific School of Yale University and instructor in forest botany in the Yale Forest School, has been appointed associate professor of biology in the new Connecticut College for Women, at New London, Connecticut. Dr. Graves will have charge of the instruction in botany.

DISCUSSION AND CORRESPONDENCE

THE SECOND YEAR OF COLLEGE CHEMISTRY

THE selection of courses immediately following general chemistry is a matter of great importance. The traditional method—old-fashioned qualitative analysis and then quantitative analysis—is being questioned.

It has long been recognized that qualitative analysis is not an end in itself—that it is of value rather in teaching advanced inorganic chemistry in a systematic way. In the last few years certain men have interpreted quali-

tative analysis by the principles of physical chemistry and thus made it an introduction to the latter subject. Others have, even more recently, demanded a quantitative interpretation of results and thus made the course an introduction to quantitative analysis.

There is no longer room in a modern course in chemistry for any extended treatment of qualitative analysis without great use of the fundamental principles of physical chemistry. For that matter, these principles are taught in general chemistry, but they are not thoroughly digested in the first year, probably because of a first-year tendency to bolt rather than to masticate such food. After the somewhat hurried meals on countless viands in the general subject the student is ready to settle down in the second year to a more thorough assimilation. Yet if at this stage he is given an endless round of unknowns in the old qualitative system he soon learns all the manipulation required, gains all there is for him from the classification, and then spends his time for months learning one new reaction after another in true encyclopedic fashion without any further great advance in general principles. He learns something more, of course, and may even enjoy the game indefinitely; but his time, after a limited amount of such work, could be spent to better advantage. A full year of this repetition work has been given in some colleges—crowding out more valuable training.

The attempt to make qualitative analysis approximately quantitative has the great defect of "delaying the game." The same discipline can be given later much more rapidly and effectively in genuine quantitative analysis. There are not enough new principles learned by this slow method to justify the very considerable time required. Furthermore, the points of teaching value are repeated *ad infinitum* without great additional gain.

In a word, qualitative analysis has had too large a place in the chemical curriculum. Far better to give the student a limited amount of this and advance him more rapidly by other courses. He will then be able to add to his knowledge of qualitative methods as required, independently of his teacher.

There are now a few excellent texts treating qualitative analysis from the viewpoint of physical chemistry, but they could be improved by the addition of laboratory drill, using accurate demonstrations of some of those fundamental principles on which students look with awe—or doubt—in the first year. True, such experiments are not qualitative at all, but it is to be hoped the instructor would rather teach advanced chemistry effectively under any name than secure the barren triumph of remaining within the narrow limits of qualitative analysis. Call it analytical, advanced inorganic—the name matters little.

Many "laws" were gulped down in general chemistry with an antiferment of skepticism to interfere with their proper digestion. To require these students in their second year actually to duplicate the historical experiments which gave occasion for those "laws" is to lay solid foundations and kindle the spark of inspiration.

Professor W. H. Chapin, in our laboratory, has developed such a course and it is well worth the attention of other teachers. Molecular theory, atomic theory, solutions, the electrochemistry of solutions, colloids, equilibrium, oxidation and reduction, complex ions and other topics of like nature are treated somewhat as in the splendid book of Stieglitz. But Professor Chapin goes farther and advocates the use of accurately performed experiments on the heat of neutralization, Boyle's law, combining weights, valence, Faraday's law, colloids, speed of reaction. Oxidation and reduction are illustrated by volumetric relations between standard solutions of oxidizing agents and reducing agents. The determination of molecular weights in two ways, the abnormality of freezing point lowering as an evidence of ionization, and other experiments of this type are found stimulating.

This work is followed by a rather brief treatment of qualitative analysis taught to illustrate the principles of equilibrium, complex ions, amphoteric hydroxides, etc., rather than as an end in itself. It is noteworthy that the previous drill in fundamentals gives the student greater facility in learning the quali-

tative routine. There is also a gain in quantitative discipline because, for example, the drill in combining weights includes the usual quantitative determination of silver as chloride and the volumetric work illustrating oxidation and reduction simplifies much of the quantitative course to follow.

A semester of this course is to be followed by quantitative analysis proper with stress on the illustration of principles.

To give this second-year course profitably the last three months of general chemistry should be devoted—in the laboratory—to the simplest possible system of qualitative analysis taught without much use of physical chemistry. I have used such a system for several years and find that it pays. The gain here is in teaching the student classification, comparison, logic, showing him a focus for the many isolated facts he had accumulated and which had begun to tire him. There is also a certain craft on the part of the teacher using this plan, for there are few first-year students not roused to enthusiasm by qualitative work. Many remain in the department for advanced courses who would otherwise have lost interest. Yet no time is wasted, for such a foundation makes possible the second-year course outlined above. The majority of every class in elementary chemistry do not go on to advanced chemistry. This plan gives them a more rounded training.

Better a genuine system than attempts to popularize the subject by unrelated tests of foods. The student has a right to a proper mental discipline even though he does not always insist upon that right.

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STYLOLITES IN QUARTZITE

TO THE EDITOR OF SCIENCE: Dr. F. L. Ransome describes and figures what he calls "Naturally Etched Quartzite" in his report on the Geology and Ore Deposits of the Breckenridge District, Colo.[1] While conducting a field course in geology from the University of Missouri in this area during the summer of 1915, the writer observed these so-called etched surfaces and interpreted them in the same way as Dr. Ransome had done, until one of the students brought in to camp a piece of the quartzite with a new structure. This was immediately recognized as a fragment of a stylolite. The writer investigated the locality at once, as he had been studying this particular structure in limestone for a number of years and was much interested in such an unusual mode of occurrence.

The locality where the stylolite was found was near where the 10,500-foot contour line crosses the small area of Dakota quartzite to the northeast of Lincoln in French Gulch. This slope is covered with masses of quartzite boulders. The study of a few specimens soon revealed the fact that the so-called etched surfaces were the exposed ends of stylolites, a type of surface the writer was very familiar with from his study of stylolites in limestone.

The very rough pitted surface produced by the stylolitic rods is well shown in Fig. 1 on plate 31 of Dr. Ransome's memoir. The depth of the depressions depends upon the length of the stylolitic columns which are rarely over one and three quarter inches in the quartzite, the majority being less than one inch (between one fourth and five eighths of an inch). When the stylolitic columns are short the pits are shallow and well rounded. Since the plane near the end of the stylolitic zone is a plane of weakness the majority of the fractures of the rock are along these planes, thus accounting for the abundance of the pitted surfaces among the quartzite boulders. The writer collected a series of specimens showing all gradations between stylolites and the so-called etched surfaces. Many specimens were collected which show the depressions still occupied by part of a stylolitic column, the fracture having occurred along the plane near the end of the columns rather than having followed the irregular line of contact of the stylolites. After the fractured surface has been exposed to the weather these ends are loosened and fall out, thus leaving the depressions. In some specimens the stylolites can be

[1] F. L. Ransome, U. S. G. S., P. P. 75, pp. 36–37, and plate 31.